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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/002,576	10/26/2001	Changmin Chun	ECB-0115	4233

27810 7590 02/28/2003

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EXAMINER

WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 02/28/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n No.

10/002,576

Applicant(s)

CHUN ET AL.

Examiner

Harry D Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 5-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 5-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. The rejection under 35 USC 103 based on Kawato et al has been withdrawn in view of the amendment of the claims to limit the carburizing atmosphere to only CO/H₂ atmospheres.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2 and 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramanarayanan et al (US 5,869,195) in view of Applicant's admission of prior art and Garg et al (US 6,287,393).

Ramanarayanan et al teach a method where a pearlitic surface layer is formed on a steel article. Ramanarayanan et al teach (see col 2, line 66 to col 3, line 12) that a surface layer of at least 1 micron is transformed by conventional carburizing methods. The method includes (equivalent to (c) of present invention) slow cooling from the carburizing treatment in order to form the pearlite microstructure.

Ramanarayanan et al do not teach the claimed method of carburizing of (a) heating to the austenite region and (b) exposing to a supersaturated carbon environment at 727-900°C.

Garg et al teach (see col 5, lines 24-46) a method of carburizing steel that includes (a) heating at 750-950°C and (b) exposing the steel to a carburizing

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atmosphere containing CO and H₂. Though Garg et al do not contain any express teachings regarding the saturation or carbon activity of the atmosphere, it would have been within the expected skill of a routieer in the art to have increased the carbon activity (by increasing the amount of CO and H₂) in the atmosphere, thereby creating a supersaturated environment, because more carbon in the atmosphere (higher carbon activity) increases the rate of carbon transfer to the iron and also increases the maximum carbon content of the iron (for support, see "Gas Carburizing").

Therefore, it would have been obvious to one of ordinary skill in the art to have performed the conventional heating and carburizing steps as taught by Garg et al as the carburizing treatment of Ramanarayanan et al because the CO/H₂/N₂ environment of Garg et al is effective at quickly facilitating carbon transfer to the steel (see Garg et al at col 7, lines 5-24).

Ramanarayanan et al further teach that an FeS surface layer is formed on top of the pearlite layer in order to add corrosion resistance to acids. However, Applicant admits as prior art (see paragraph 3) that pearlite was known to be resistant to corrosion by organic acids. Therefore, the FeS layer of Ramanarayanan et al is not needed as the pearlite layer provides sufficient corrosion resistance for certain environments.

Regarding claim 2, Ramanarayanan et al teach (see col 2, lines 49-52) that preferred steels include 0.6-0.9 wt% Mn and 0.1-0.5 wt% Si.

Regarding claims 5 and 8, Garg et al teach (see col 7, lines 5-24) that the carburizing atmosphere contains CO and H₂ mixed with N₂ (inert). The preferred ratio is

1:1 CO:H₂ (i.e.-50% CO, 50% H₂). Therefore, it would have been obvious to perform the carburizing with such an atmosphere because it produces quick transfer of carbon to the steel as taught by Garg et al.

Regarding claim 6, it would have been within the expected skill of a routineer in the art to have optimized the time of treatment in order to adjust the depth of the carburized layer that forms pearlite upon slow cooling (for support that treatment time affects carburized depth, see Kerridge at col 3, lines 22-27).

Regarding claim 7, Ramanarayanan et al teach (see col 1, lines 41-42) that the thickness of the pearlitic region is preferably at least 20 microns.

Regarding claim 9, Ramanarayanan et al teach (see col 3, lines 9-12) that when the surface pearlite was formed, only the surface layer was required to have more than 0.7 wt% C. Thus, the bulk alloy of Ramanarayanan et al contains less than 0.7 wt% C.

Response to Arguments

4. Applicant's arguments filed 10 January 2003 have been fully considered but they are not persuasive. Applicant argued that:

- a. Garg et al's teaching of including oxygen in the carburizing atmosphere is opposite to the findings of the present invention;
- b. Garg et al teach away from the presently claimed range of CO;
- c. Garg et al do not teach CO/H₂ ratios or carbon activities; and,
- d. The sulfur modification of Ramanarayanan et al removes the reason to combine with Garg et al.

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In response to Applicant's first argument, though the carburizing atmosphere described by Garg et al does contain oxygen, there is no limitation in the present claims excluding oxygen from the atmosphere.

In response to Applicant's second argument, Garg et al in fact directly teach values of CO/H₂ that are within the claimed range. Thus, Garg et al do not teach away from the presently claimed range of CO/H₂.

In response to Applicant's third argument, Garg et al teach (see col. 7, lines 5-24) carburizing atmospheres with the CO/H₂ ratio being about 1, with the atmosphere containing 20-50% CO (with the balance being oxygen and inert nitrogen). Though Garg et al do not contain any express teachings regarding the saturation or carbon activity of the atmosphere, it would have been within the expected skill of a routineer in the art to have increased the carbon activity (by increasing the amount of CO and H₂) in the atmosphere, thereby creating a supersaturated environment, because more carbon in the atmosphere (higher carbon activity) increases the rate of carbon transfer to the iron and also increases the maximum carbon content of the iron (for support, see "Gas Carburizing").

In response to Applicant's fourth argument, the sulfur modification taught by Ramanarayanan et al occurs as a separate step after the formation of the pearlite surface layer. Thus, the intermediate product is a steel with a pearlite surface layer that is formed by conventional carburizing methods. Therefore, it would have been obvious to one of ordinary skill in the art to use a conventional carburizing method, such as that of Garg et al, to form the pearlite surface layer.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 6:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
February 25, 2003


ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700